



United States Department of the Interior

GEOLOGICAL SURVEY
Water Resources Division
505 Marquette NW, Room 720
Albuquerque, New Mexico 87102
December 16, 1985

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NORDHAUS, HALTOM
TAYLOR & TARADASH

Mr. Mackie Murphey
Bureau of Indian Affairs
Area Rights Protection Officer
P.O. Box 8327
Albuquerque, New Mexico 87198

CONFIDENTIAL CLAIM RETRACTED

DATE: 5/16/13 AUTHORIZED BY:

Dear Mr. Murphey:

In accordance with modification number three of the Memorandum of Understanding between the BIA and the USGS (contract number MOOC-1420-4039), the following exploratory test-hole site descriptions on Acoma and Laguna Pueblo Indian lands are provided for your information:

The exploratory test-hole site locations described below are in the general vicinities of Acoma Valley, Anzac, and Casa Blanca (figs. 1 and 2). Nine accessible drill sites were field checked on November 21, 1985 (fig. 1). Funds, however, are available to drill only two or three test holes depending upon possible increases in costs that may result if excessive cavings from the Chinle Formation or lost circulation of drilling fluids into caverns of the San Andres Limestone occurs. Plans are to drill one hole in each of the three general areas, if feasible.

The purpose for drilling the test holes is to obtain hydrologic information about the San Andres-Glorieta aquifer in the Acoma Embayment between the Zuni and Lucero Uplifts (fig. 2). The information is needed to define the ground-water supplies beneath the Acoma and Laguna lands.

In order to make the best use of the allotted funds, the test holes will be smaller in diameter than a large capacity production well. It is necessary to know more about the character and extent of the aquifer before expensive production wells can be accurately located and efficiently drilled. The test holes, which will be cased with 6 5/8-inch steel casing, will be the property of the U.S. Bureau of Indian Affairs (BIA) for use by the Pueblos, possibly for future monitoring of water levels in the aquifer.

This drilling activity is associated with the San Andres-Glorieta aquifer study (project NM83-246) that is being conducted by the U.S. Geological Survey (USGS) in cooperation with the Pueblo of Acoma, Pueblo of Laguna, New Mexico State Engineer Office, and the BIA. Funds have been transferred from BIA to the USGS (project NM83-345) for the costs of contracting and supervising the drilling, the actual drilling, and agency overhead.



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Evaluation of Existing Geohydrologic Data
and Descriptions of Test-Hole Sites

Available information about the geology and hydrology of the San Andres-Glorieta aquifer and the overlying rocks that will be drilled was studied. This includes reports by Baldwin, Dinwiddie, Gordon, Lyford, Maxwell, Risser, Thaden, West, and others, as well as petroleum test-hole data such as that from the Shell Oil Company hole near Acoma Valley and the Gottlieb hole near Anzac. The Acoma No. 1 water test-hole (fig. 2) drilled last year as part of this investigation proved that potable water in large quantities is present along part of the west boundary of the Acoma Pueblo. Of particular use in estimating the conditions at the tentative drill sites were geologic sections prepared by J. A. Baldwin.

The general lithology, geologic formations, and their estimated depths at the three general drill sites are given below:

Acoma Valley

Site 1A (Sand Canyon)

Approximate location: SW 1/4 of SW 1/4 of Sec. 20, T.8N., R.6W.
Est. surface altitude: 6,020 ft.
Est. potentiometric surface altitude: 6,125 ft.
Est. total depth of test hole: 2,250 ft.

<u>Depth below land surface in feet</u>	<u>Lithology and geologic formations</u>
0- 50	Alluvial silt and sand
50-1,600	Mudstone, siltstone, and sandstone of Chinle Formation
1,600-2,250	Dolomite, limestone, siltstone, and sandstone of San Andres-Glorieta aquifer

Sites 1B, 1C, or 1D

Approximate location, 1B: SE 1/4 of SE 1/4 of Sec. 20, T.8N., R.7W.
Est. surface altitude, 1B: 6,330 ft.
Approximate location, 1C: NW 1/4 of SE 1/4 of Sec. 17, T.8N., R.7W.
Est. surface altitude, 1C: 6,260 ft.
Est. surface altitude, 1D: 6,300 ft.
Est. potentiometric surface altitude in area: 6,200 ft.
Est. total depth of test holes 1B, 1C, 1D: +2,800 ft.

<u>Depth below land surface, in feet</u>	<u>Lithology and geologic formations</u>
0- 50	Alluvial silt and sand
50- 200	Sandstone of Zuni and Bluff Sandstones
200- 300	Mudstone, siltstone, and sandstone of Summerville Formation
300- 500	Sandy limestone of Todilto Limestone and mudstone, siltstone, and sandstone of Entrada Sandstone
500-2,200	Mudstone, siltstone, and sandstone of Chinle Formation
2,200-2,800	Dolomite, limestone, siltstone, and sandstone of San Andres-Glorieta aquifer

Anzac

Sites 2A, 2B, or 2C

Approximate location, 2A: SE 1/4 of NE 1/4 of Sec. 25, T.10N., R.9W.

Approximate location, 2B: SW 1/4 of SE 1/4 of Sec. 25, T.10N., R.9W.

Approximate location, 2C: E 1/2 of SE 1/4 of Sec. 26, T.10N., R.9W.

Est. surface altitude, 2A, 2B, 2C: 6,300 ft.

Est. potentiometric surface altitude in area: 6,350 - 6,375 ft.

Est. total depth of test holes 2A, 2B, 2C: +3,200 ft.

<u>Depth below land surface, in feet</u>	<u>Lithology and geologic formations</u>
0- 50	Alluvial silt and sand
50- 100	Shale, coal, and sandstone of Dakota Sandstone
100- 150	Mudstone and sandstone of Morrison Formation
150- 500	Sandstone of Zuni Sandstone
500- 700	Claystone, siltstone, and sandstone of Summerville Formation
700- 750	Limestone of Todilto Limestone
750-1,100	Siltstone and sandstone of Entrada Sandstone
1,100-2,800	Mudstone, siltstone, and sandstone of Chinle Formation
2,800-3,200	Dolomite, limestone, siltstone, and sandstone of San Andres-Glorieta aquifer

Casa Blanca - Seama

Site 3A (Casa Blanca)

Approximate location: NW 1/4 of Sec. 10, T.9N., R.6W.

Est. surface altitude: 5,900 ft.

Est. potentiometric surface altitude: 6,175 ft.

Est. total depth of test hole: +2,800 ft.

Site 3B (Seama)

Approximate location: SW 1/4 of SW 1/4 of Sec. 31, T.10N., R.6W.

Est. surface altitude: 5,960 ft.

Est. potentiometric surface altitude: 6,200 ft.

Est. total depth of test hole: +2,800 ft.

<u>Depth below land surface, in feet</u>	<u>Lithology and geologic formations</u>
0- 50	Alluvial silt and sand
50- 300	Mudstone and sandstone of Morrison Formation
300- 600	Sandstone of Zuni and Bluff Sandstones
600- 950	Mudstone, siltstone, and sandstone of Summerville Formation and Entrada Sandstone, and limestone of Todilto Limestone
950-2,400	Mudstone, siltstone, and sandstone of Chinle Formation
2,400-2,800	Dolomite, limestone, siltstone, and sandstone of San Andres-Glorieta aquifer

General Design of Exploratory Test-Holes

Each of the holes at the three sites will have the same general design (fig.3), although the depths and formations penetrated will vary somewhat. The test hole at Site 1A would start in the Chinle Formation beneath thin surface alluvium and penetrate the San Andres Limestone and Glorieta Sandstone. The other Site 1 test holes, the Site 2, and the Site 3 holes would penetrate about 500, 1,100 and 950 feet of younger rocks, respectively, in addition to the Chinle Formation, San Andres Limestone, and Glorieta Sandstone. Figure 3 is a general design of the test hole construction. After the specific sites to be drilled are chosen, more specific test-hole construction designs can be prepared.

Anticipated Sequence of Drilling Procedures For Three Exploratory Test-Holes

1. Mobilization and demobilization: Includes furnishing drill rig and all necessary labor, equipment, tools, and materials such as drilling mud and water; moving to and from the site; site preparation, and site restoration after drilling is completed.
2. Drill borehole to about 50 feet or deeper if necessary to prevent surface wash out. Hole should be large enough to accommodate 9 5/8-inch casing.
3. Furnish, install, and cement about 50 feet or more of 9 5/8-inch surface casing.
4. Drill borehole to top of San Andres Limestone at depths ranging

from 1,600 to 2,800 feet. Hole should be large enough to accommodate 6 5/8-inch casing.

5. Furnish, install, and cement 6 5/8-inch casing to top of San Andres Limestone.
6. Drill 5 7/8-inch hole and spot core a few feet at a time for a total of about 40 feet to base of Glorieta Sandstone at depths below the 6 5/8-inch casing ranging from 2,250 to 3,200 feet.
7. Run U.S.G.S. geophysical logs or commercial logs if U.S.G.S. logger is not available.
8. Clean out test hole and develop aquifer by surging and air lifting. Set 4 1/2-inch screen or slotted liner opposite the San Andres-Glorieta aquifer if needed to prevent caving.
9. Gun perforate Sonsela Sandstone of Chinle Formation in one key test hole if logs indicate that the unit is well developed in order to obtain hydraulic heads and water quality. Set a packer below the Sonsela in the casing and air jet water to the surface. Water samples will be collected for chemical analyses.
10. Squeeze cement the perforations opposite the Sonsela Sandstone.
11. Demobilize the rig and clean up the site.
12. Mobilize pumping equipment to be furnished by the drilling contractor.
13. Perform aquifer pumping tests at maximum discharge rates possible considering casing size and lift. Tests will be run at least 12 hours and probably longer depending upon aquifer conditions. Water samples will be collected for chemical analyses.
14. Demobilize pumping equipment. Install shutoff valve if test holes flow or hinged cover if not flowing. Maintain test holes for monitoring future hydraulic head changes in the San Andres-Glorieta aquifer system.

Drill-Site Priorities

The sequence in which the three test holes are drilled should be based primarily on the most hydrologic information that can be obtained and the most efficient use of the available funds. A critical need is to find out more about the areal extent and potential of the aquifer. Without that knowledge the size of the water supply will not be known and the effects of developing the aquifer cannot be properly simulated. With these criteria in mind the following site-sequence for drilling is suggested:

1. Site 1A, Sand Canyon near Acoma Valley.
This site will give excellent information on the aquifer to the east where it is most needed. The depth to the aquifer is about

600 feet shallower than 1B, 1C, and 1D. The costs of drilling Site 1A will be much less and it will be easier to reduce drilling problems at this site. This site is the most favorable place to drill completely through the aquifer and obtain the best information for the least cost.

2. Site 2A, Anzac

This site is at a location where reasonably large quantities of potable water may be found. It is fairly close to outcrops of the San Andres Limestone. The aquifer character at Site 2A is expected to be somewhat similar to that of the aquifer penetrated by Acoma No. 1. The cost of drilling Site 2A will be more than the cost of drilling at Casa Blanca or Sand Canyon because the aquifer is 600 to 1,200 feet deeper. The chances of drilling completely through the aquifer at Site 2A will be less if cavernous conditions exist there, as they do at the Acoma No. 1 site to the south.

3. Site 3A Casa Blanca

A test-hole at this site will provide valuable information regarding the extent of the aquifer to the northeast. For this reason it is given priority over the Seama 3B site. If the aquifer conditions are found to be favorable at Site 1A (Sand Canyon), it might be advantageous to drill Site 3A before drilling Site 2A at Anzac.

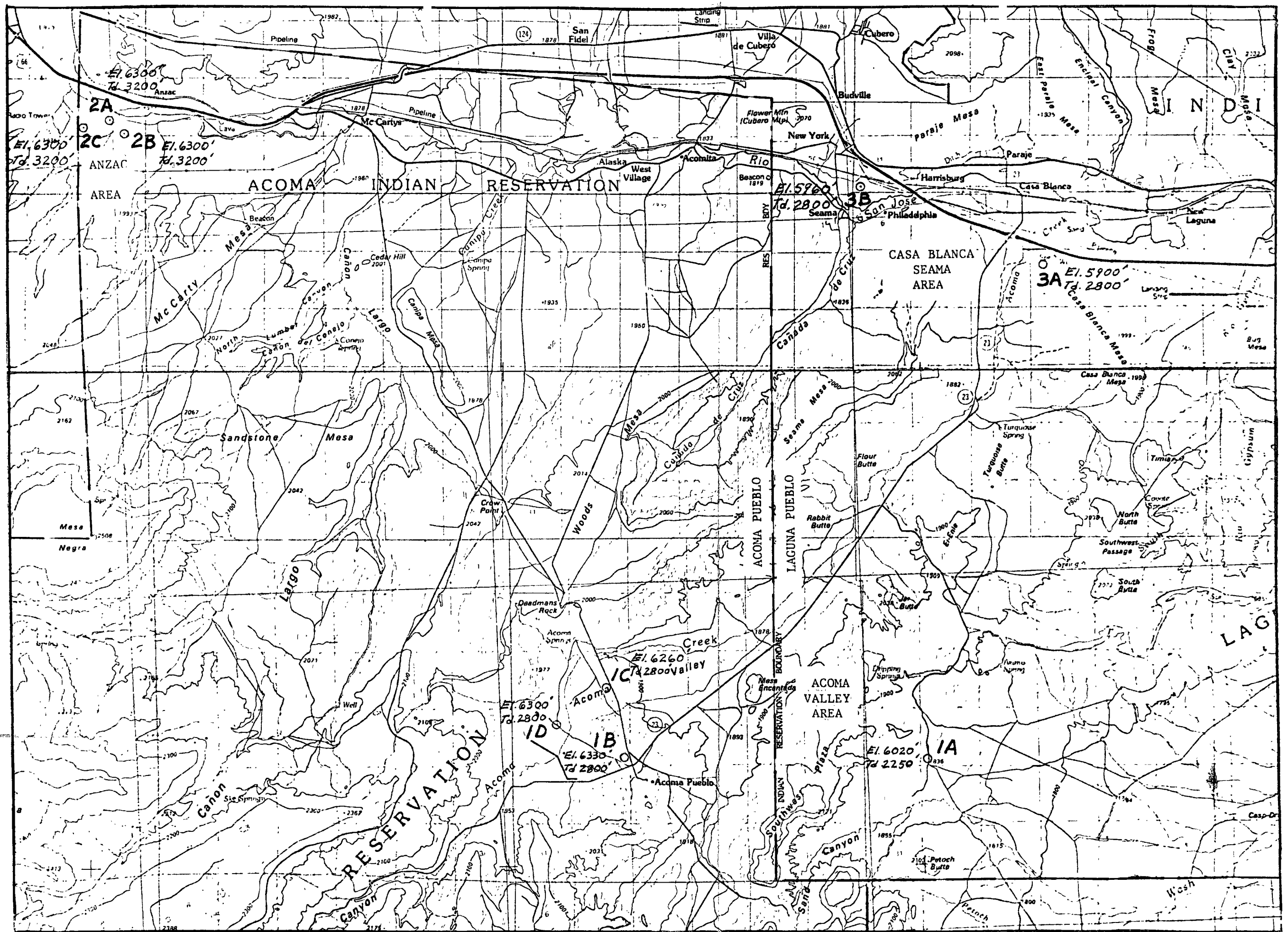
I understand that you or your staff will be discussing the merits of the sites with representatives of the Acoma and Laguna Pueblos. As soon as three specific sites are agreed upon, we will write the drilling specifications and proceed with the contract awarding process. We hope to start drilling in March 1986 if all goes well.

Sincerely,



Robert L. Knutilla
District Chief

cc: Laguna Pueblo (L. Taylor)
Acoma Pueblo (H. Ranquist)
NM State Engineer Office (E. Martinez)

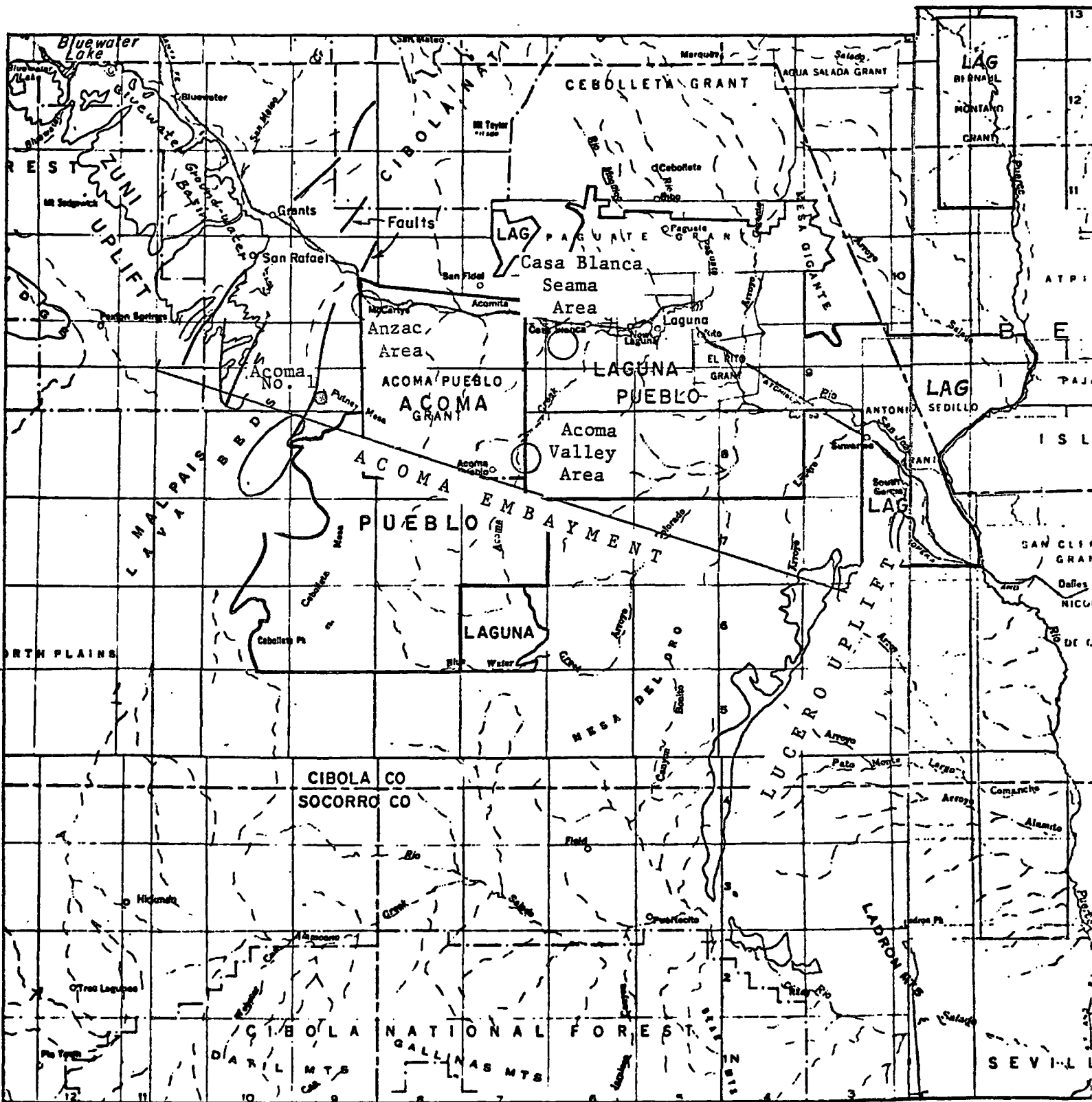


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Figure 1. -Exploratory test-hole site locations.

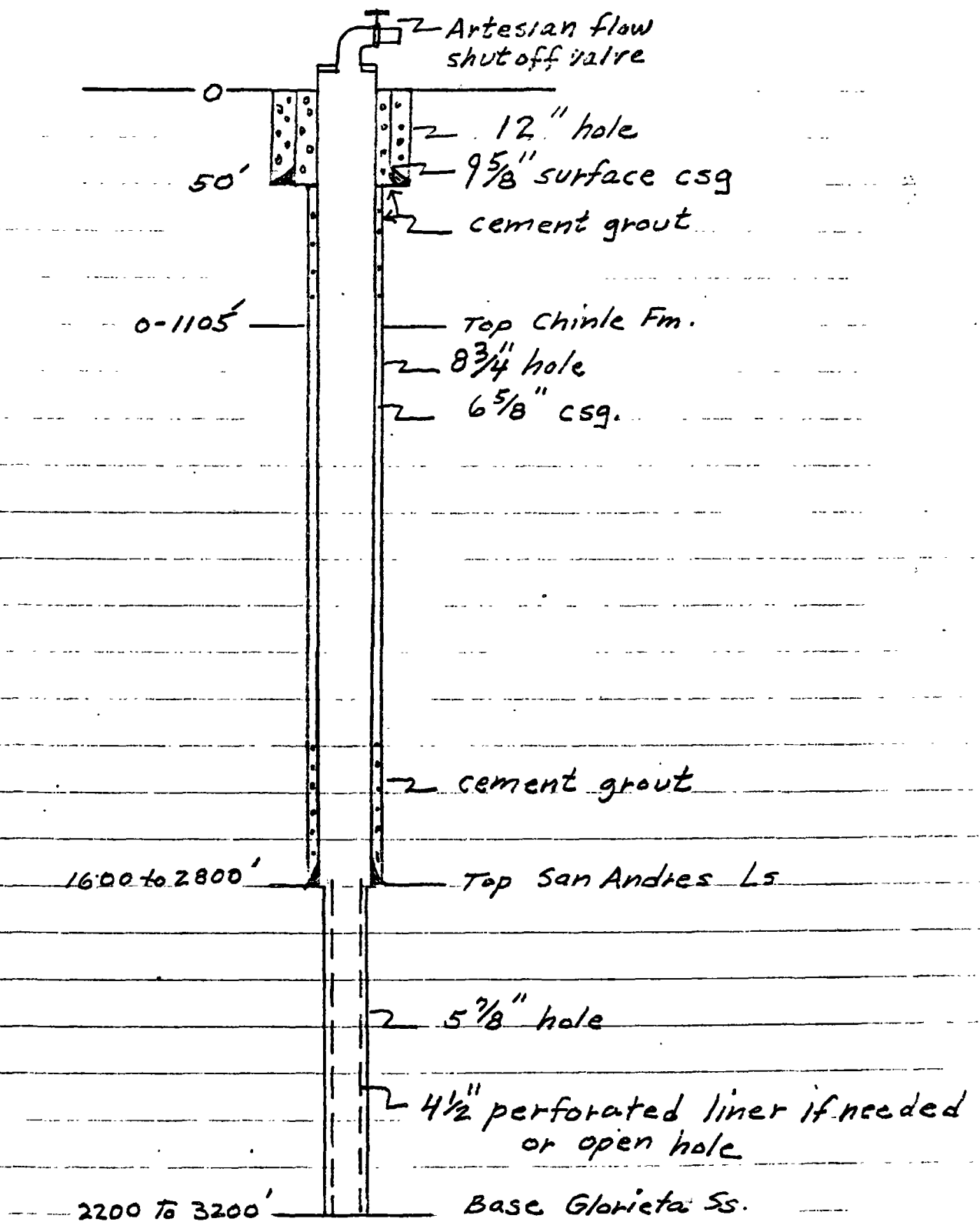
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USGS WRD

Figure 2.--Location of Acoma Embayment, Zuni and Lucero Uplifts, and exploratory test-hole site areas.



USGS WRD

Figure 3.—General design for exploratory test holes.